

REMARKS

Summary

This application is a nationalization of a PCT application under 35 U.S.C. §371. Amendments have been made to place the application in a better form for examination.

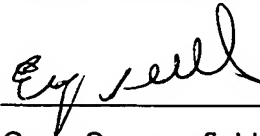
Claims 1-5 have been cancelled and new Claims 6-21 have been presented. The claims have been rewritten to better express the subject matter being claimed. The claims also incorporate the amendments made in the PCT application.

The specification has been amended, and due to the number of changes, a substitute specification has been prepared. No new matter has been added. The amendments to the specification incorporate most of the amendments made in the PCT application. The amendment adding a paragraph of background discussion of a U.S. Patent reference has not been added.

Conclusion

Claims 6-21 are pending. The Applicants respectfully submit that the pending claims are allowable and look forward to the early issuance of a Notice of Allowance. The Examiner is respectfully requested to contact the undersigned in the event that a telephone interview would expedite consideration of the application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Craig Summerfield", is written over a horizontal line.

Craig Summerfield
Registration No. 37,947
Agent for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

Attorney Docket No. 11371-112
Siemens AG Ref. No. 2002P18859WOUS
Substitute Specification With Markings

"Express Mail" Mailing Label:

Date of Deposit:

Our Case No. 11371-112
Client Ref. No. 2002P18859WOUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTORS:

Gerhard Helmreich
Stefan Leidenberger

TITLE:

PATIENT POSITIONING DEVICE
FOR A COMPUTER TOMOGRAPH

AGENT:

Sid Bennett (Reg. No. 53,981)
BRINKS HOFER GILSON & LIONE
Post Office Box 10395
Chicago, Illinois 60610
(312) 321-4200

Attorney Docket No. 11371-112
Siemens AG Ref. No. 2002P18859WOUS
Substitute Specification With Markings

PATIENT POSITIONING DEVICE FOR A COMPUTER TOMOGRAPH

TECHNICAL FIELD

[0001] This ~~application invention~~ relates to a patient positioning device for a computer tomograph device ~~and, to a computer tomograph device having a~~ patient positioning device of this kind.

BACKGROUND

[0002] A ~~Computer tomograph devices or CT device for short~~ (CTs), serve to make three-dimensional images or images of slices of a body. The image data are computed by a computer using two-dimensional X-ray projections of the body. For recording the two-dimensional raw image data, an X-ray beam source and an image detector are disposed diametrically opposite one another and rotate about the body to be examined. The rotation takes place inside a gantry which has an examination opening, or aperture, into which the body can be introduced.

[0003] The position of the body in the gantry and the stability of the body ~~its position there are decisive~~ affect for the CT image quality. A patient positioning device ~~must~~ should therefore assure sufficiently stable support of the patient's body and should not have any significant sagging, for instance, in response to the patient's weight. At the same time, ~~though~~ however, a complicated construction for supporting the patient's body in the examination opening of the gantry cannot be used, because it would create interfering artifacts in the image ~~there~~.

[0004] On the other hand, a patient positioning device should be adjustable flexibly enough that handling the patient when shifting ~~him~~ the patient onto the patient positioning device and providing medical care of a patient already lying on it is made simpler. For example, it may be desirable for the patient positioning device to be able to be lowered so the patient can lie down on ~~it~~ the patient positioning device ~~and or~~ raised so the patient can get up from ~~it~~ the patient positioning device.

[0005] Good accessibility for medical staff is advantageous, and for that reason the space below the patient positioning device should ~~as much as possible~~ be as free possible and without intervening ~~constructions~~structures.

[0006] ~~From German patent disclosure DE 101 08 549, teaches~~ a patient positioning device ~~is known~~ that enables flexible positioning and assures a stable position of the patient's body in the examination opening of the gantry of a CT device. However, ~~it offers~~the positioning device offers no possibility of height adjustment, and ~~below the patient lying on it, it has a bulky construction below the patient,~~ which makes accessibility more difficult.

[0007] ~~The object of the invention is to disclose~~ A a patient positioning device for a computer tomograph (CT) device and a CT device having such a patient positioning device are described. ~~The patient positioning device which~~ ensures a stable position of the patient body in the examination opening of the gantry, is simultaneously flexibly adjustable in position, and has good accessibility to medical staff.

[0008] ~~This object is attained by a patient positioning device having the characteristics of the independent claim.~~

[0009] The patient positioning device for a computer tomograph device which device includes a gantry supported on a base; the patient positioning device includes a bed guide for a patient bed; and and has an arm which is supported on or at the base by a rotating joint that is rotatable about a horizontal axis, in the vicinity of the head end and the foot ends thereof by rotating joints that are rotatable about a horizontal axis that is disposed perpendicular to the length of the patient positioning device., and Tthe bed guide is supported on the arm by a rotating joint that is rotatable about a horizontal axis, and that is perpendicular to the length of the patient positioning device. and Tthe height of the bed guide is adjustable by movement of the arm about the rotating joints supporting the arm. When the bed guide is partly or completely lowered, the rotating joint is not located underneath the bed guide.

[0010] ~~Because of the support of the~~ The bed guide is supported on an arm in the vicinity of its head end or foot end. When the bed guide is partly or completely lowered, that extends from the base of the CT device, a construction is obtained in which the space below the bed guide remains free.

5 [0011] This assures good accessibility to the patient. The term bed guide should be understood in this context to mean a structural element that makes it possible to attach a patient bed. The bed guide may have the capability of being solidly connected to a patient bed, or it may be embodied as a rail-like guide that allows the patient bed to be placed on the bed guide or slidably inserted therein
10 for displacement in the longitudinal direction. ~~it or inserted and that guides the patient bed displaceably in the longitudinal direction~~

[0012] The motion of the patient bed that results from the rotatable mounting of the arm ~~on the base of the gantry in the vicinity of its head end or foot end~~ has the further advantage that the patient bed, on being lowered so a patient can be placed on it, is simultaneously moved the bed away from a gantry and downward.
15 Because of the greater distance of the patient bed from the gantry when in this position, the accessibility of the patient bed is improved and, furthermore, there is less interference with any operation of the gantry that may be taking place at the same time. Thus, a CT examination can, for instance, proceed unimpeded for a first patient, while another patient is being placed on ~~the another~~ lowered patient bed.

[0013] While being raised, the bed guide is also simultaneously moved closer to the gantry, which is an improvement in terms of wear and tear on the patient bed and thus on the patient's body in the examination area. For instance, the leverage with which the patient weight is supported relative to the bed guide and which causes sagging of the patient bed is reduced.

25 [0014] ~~In an advantageous embodiment of the invention,~~ In an aspect, the patient positioning device has a height adjuster, which is connected to the arm such that the height adjuster ~~it~~ can rotate the arm about the rotating joint by which
30 the arm is supported in the vicinity of the head end or foot end of the base ~~on or at~~

the base. The height adjuster ~~may have~~ has a motor for this purpose, which adjusts the arm, for instance, by means of a worm drive associated with the motor and a gear wheel on the arm. The motor may also drive a hydraulic drive that drives the arm around the rotating joint. The height adjuster ~~assures~~ permits an automatic adjustment of the height of the patient bed and thus makes the work of the medical staff easier.

[0015] In ~~another aspect~~ further advantageous embodiment, the patient positioning device has a support arm, which is supported on the arm by a rotating joint that is rotatable about a horizontal axis, and on which support arm the bed guide is supported by a ~~rotating joint~~ that is rotatable about a horizontal axis, ~~and its~~ The length of the arm length is ~~may~~ be automatically adjustable such that the orientation of the bed guide remains stable, regardless of a rotation of the arm.

This ~~assures~~ permits ~~that a patient can~~ to be placed, for instance, on ~~the a~~ horizontally oriented patient bed, and ~~that this~~ the orientation of the patient bed to ~~be~~ maintained when the height of the patient bed is adjusted.

[0016] Maintaining the orientation of the patient bed is ~~on the one hand~~ pleasant for the patient who is being moved automatically by the patient positioning device, ~~On the other hand,~~ it enables positioning the patient, with the patient bed lowered, in exactly the position in which an ensuing CT examination is to be done. Changes in the patient position, as the patient positioning device is moved to approach the gantry, which could cause movements on the part of the patient and hence interfering artifacts ~~from that motion~~ in the CT image data, are thus averted.

[0017] The automatic adjustment of the length of the support arm can be implemented ~~by the same principle as in~~ a similar manner to the rotary motion of the arm. For instance, if the rotary motion is attained purely mechanically, such as by a worm drive and a gear wheel, then the adjustment of the length of the support arm can also be accomplished by means of a mechanical gear-wheel or lever system. If the rotary motion of the arm is ~~conversely~~ driven hydraulically, then the length of the support arm can also be adjusted hydraulically.

[0018] ~~The H~~hydraulic adjustment enables ~~especially~~ flexible movement of both the arm and the support arm, so that the height of the patient bed is adjustable ~~via-by~~ the arm, and ~~its-the~~ orientation is adjustable ~~via-by~~ the support arm, freely and independently of one another. If the orientation of the bed guide is to be maintained while the arm is being adjusted, the longitudinal adjustment of the support arm may be adapted to the motion of the arm. ~~To that end,~~ The hydraulic drive can perform the longitudinal adjustment in accordance with a characteristic curve as a function of the adjustment of the arm. The characteristic curve depends on the geometric relationships among the arm, the support arm, and their rotating joints.

[0019] In a ~~further advantageous embodiment of the invention~~ further aspect, a ~~computer tomography~~ CT device has one patient positioning device on each side of the through-hole opening, or aperture, of the gantry. ~~This makes it possible to perform CT examinations of a plurality of patients particularly may be performed~~ smoothly and quickly.

[0020] That is, ~~while one patient can be placed on the lowered patient bed on one side of the gantry, and another patient located on the other patient positioning device can be examined in the CT device at the same time contemporaneously.~~ Once the examination is concluded, the patient bed is lowered and thus moved away from the gantry. This makes the examination opening available for the examination of the next patient, who is moved toward the examination opening by the ~~approaching~~ motion of another patient positioning device. The patient bed of ~~the a further~~ patient to be examined can then be introduced into the bed guide, ~~which has meanwhile become available~~, of the patient positioning device on the opposite side. The CT examination of that patient then begin while the patient positioning device on the second side is lowered again for receiving ~~the next a~~ further patient.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] ~~Further advantages of the invention will become apparent from the drawings.~~

[0022] Exemplary embodiments of the invention will be described in further detail below in conjunction with the drawings. Shown are:

[0023] Fig. 1 ~~is,~~ a perspective view of a CT device with a patient positioning device, ~~in perspective;~~

[0024] Fig. 2 ~~is, the a side view of the~~ CT device with the patient positioning device, ~~in a side view;~~ and

[0025] Fig. 3, ~~is the a side view~~ CT device with another example of the patient positioning device, ~~in a side view.~~

DETAILED DESCRIPTION

[0026] Exemplary embodiments may be better understood with reference to the drawings, but these examples are not intended to be of a limiting nature. Like numbered elements in the same or different drawings perform equivalent functions.

[0027] ~~In Fig. 1, A~~ a CT device 1 with a patient positioning device is shown in a perspective view in Fig. 1. The CT device 1 has a gantry 3 with an examination opening. The gantry 3 rests on a base 5. A patient ~~who is to be examined~~ is placed on a patient bed 9, which is introduced into the bed guide 7. The bed guide 7 guides the patient bed 9 ~~such a way so~~ that the patient bed is displaceable longitudinally, such that the patient bed 9 may be introduced into the examination opening or aperture in the gantry 3. ~~In the drawing, a G~~gantry 3 is shown with ~~on~~may have a patient positioning device on each side of the examination opening, and ~~it can be seen that the patient bed 9, on being introduced into the aperture in gantry 3, is transferred is introduced into the bed guide 7' of the opposite patient positioning device disposed at the opposite side of the aperture.~~

[0028] The bed guide 7 is supported ~~rotatably~~ in the arm 11 ~~about a horizontal axis~~ via a rotating joint 19, rotatable about a horizontal axis. The arm 11 is ~~in turn~~

supported in or on the base 5 ~~via-by~~ a rotating joint 17 ~~that-such~~ that the arm 11 is rotatable about a horizontal axis. The rotating joint 17 may be integrated with the base 5, ~~or-else~~, Alternatively, the rotating joint 17 may be as-part of the patient positioning device, and ~~it-may-be~~ merely be mounted in the vicinity of the base 5 but not embodied as an integral part of it ~~thereof~~. ~~As a result~~, Thus, the patient positioning device can be ~~conceived-of-as-be~~ a structural unit that is independent of the CT device 1 and that may be joined to it in modular fashion.

[0029] ~~To adjust~~ The height of the bed guide 7 is adjusted by rotating, the arm 11 ~~is-rotated-about~~ the its rotating joint 17. In the process, to maintain the bed 9 orientation, which in the drawing is horizontal, the bed guide 7 ~~is likewise rotatable~~ also rotates about the corresponding rotating joint 19.

[0030] The orientation of the bed guide 7 is stabilized by means of a support arm 13. The support arm 13 supports the bed guide ~~in such a way that~~ sagging ~~because due to~~ of the patient's weight is ~~prevented~~ reduced. To enable maintaining the orientation of the bed guide 7 while the height is being adjusted, the support arm 13 is supported in the arm 11 ~~via-by~~ a rotating joint 21 that is rotatable about a horizontal axis, and ~~in the bed guide 7 via-by~~ a rotating joint 23 in the bed guide 7 that is likewise rotatable about a horizontal axis. The length of the support arm 13 may be adjusted mechanically by a gear-wheel or lever system that is driven by a rotary motion of the arm 11. ~~On the other hand~~ Alternatively, the support arm 13 length adjustment may be effected hydraulically and may be adapted to the rotary motion of the arm 11 by means of a characteristic curve for controlling the hydraulic drive. The rotary motion of the arm 11 can be driven ~~equally well~~ either mechanically, for instance ~~via-by~~ a motor-driven worm gear and a gear wheel on the arm, or by a hydraulic drive.

[0031] ~~As needed~~, The patient positioning device may be configured such that the bed guide 7 automatically ~~always~~ maintains a horizontal orientation, or such that the orientation of the bed guide 7 can be adjusted by the medical staff. Upon adjustment of the height by rotation of the arm 11, an orientation, once

assumed, is automatically maintained by means of the mechanics or the hydraulics.

[0032] ~~Of the further~~ Another patient positioning device, located on an opposite side of the gantry 3, is illustrated by only the bed guide 7', is visible in the drawing Fig. 1. The other components, which are not visible, correspond to those that are shown visibly on a is front side of the gantry 3. The gantry 3 may have a patient positioning device on either one side or on both sides.

~~In a further embodiment, the gantry 3 has a patient positioning device on only one side.~~

[0033] ~~In Fig. 2 shows a side view of , the same the~~ CT device 1 with the patient positioning device disposed on each side of the gantry 3, ~~with A~~ a patient bed 9 introduced into ~~only the left-hand one of the two bed guides 7, 7'.~~ It can be seen from this drawing that T the t second patient positioning device, which in the preceding drawing was for the most part not visible, also has an arm 11', with rotating joints 17', 19' that are rotatable about horizontal axes, and a support arm 13, with rotating joints 21', 23' that are rotatable about horizontal axes.

[0034] A height adjuster 15 serves to adjust the height of the bed guide 7 by means of a rotary motion of the arm 11 about the joint 17. ~~To that end, it drives T the rotary motion of the arm 11 is by motor, either mechanically, or hydraulically.~~ The individual components of the height adjuster 15 are not shown in the drawing. ~~What is visible in the drawing is that E~~ each of the two patient positioning devices has its own height adjuster 15, 15', which makes so that it possible to adjust the height of each of the two bed guides 7, 7' may be adjusted independently of one another.

[0035] ~~In In another aspect, Fig. 3 shows a side view of , a~~ CT device 1 with one patient positioning device on each of the two sides of the gantry 3 ~~is shown in a different embodiment, in a side view.~~ The patient positioning devices have the similar characteristics to the patient positioning devices shown in Fig. 2, with the exception of the support arms 13, 13'. Support arms 13, 13', are rotatably attached to the height adjusters 15, 15', and to the bed guides 7, 7' by rotatable

hinges 23, 23' and cooperate with the base 5, 5, and the bed guides 7, 7' to create a parallelogram structure with the arms 11, 11'. Such an arrangement assures the horizontal orientation of the bed guides 7, 7' during a height adjustment process. The arms 11, 11' are supported as described above and are driven by height
5 adjusters 15, 15', the support arms 13, 13' are now located parallel to the arms 11, 11'. While one bearing point of the support arms 13, 13' is still located in bed guides 7, 7', the other bearing point is located in or on the base 5, to achieve a parallelogram arrangement.

[0036] The parallelogram arrangement mechanically maintains the orientation
10 of the bed guides 7, 7' regardless of the motions of the arms 11, 11', To make a change in the orientation of the bed guides 7, 7', the support arms 13, 13', in this example, may be adjustable in length. The length adjustment can be effected mechanically or hydraulically.

[0037] Although only a few exemplary embodiments of this invention have
15 been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of the invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the following claims.

ABSTRACT OF THE DISCLOSURE

~~The invention relates to A~~a patient positioning device for a computer tomographic device having a gantry supported on a base is disclosed(1),
5 ~~comprising a gantry (3), supported on a base (5), whereby T~~the patient positioning device comprises a bed guide (7, 7'), for a patient bed (9), ~~comprising~~
having an arm (11, 11'), mounted on or to the base (5 by means of a rotating joint (17, 17') which rotates about a horizontal axis. The bed guide (7, 7') is mounted to
10 the arm (11, 11') by means of a rotating joint (19, 19') which rotates about a horizontal axis, and the height of the bed guide (7, 7') may be adjusted.